

Evelyn L. Rosen, PhD

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Mission:

I am a chemist with an emphasis in organic chemistry and quantum dot synthesis/characterization pursuing a research position in materials chemistry.

Summary of key skills and accomplishments:

- Post-doctoral and graduate research projects have lead to several patents
 - Extensive experience with research publication writing and editing
 - Development of innovative methods for surface modification of nanocrystals to impart improved transport
 - Expertise in nanocrystal thin-film device fabrication and testing (field effect transistors)
 - Focus in synthetic organic chemistry with emphasis in catalysis, polymers, and organometallics
 - Experience with diverse analytical techniques including electrochemical, photoluminescent, and macromolecular analyses
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Education:

Lawrence Berkeley National Laboratory, Berkeley, CA 2010-current
Post-Doctoral Associate, Organic and Macromolecular Synthesis Facility, Materials Science Division
Research focused on the development of new strategies for nanocrystal surface modification to promote understanding and optimization of ligand-surface interactions and resulting device performance
Research advisor: Brett A. Helms

The University of Texas at Austin, Austin, TX 2006-2010
Ph. D. in Organic Chemistry
Thesis title: "Synthesis and Study of New Classes of Ruthenium Metathesis Catalysts"
Research advisor: Christopher W. Bielawski

The University of California Santa Barbara, Santa Barbara, CA 2002-2006
B.S. in Chemistry
Undergraduate research focused on the development of an unprecedented catalytic lactone forming reaction
Undergraduate research advisor: Jeffrey W. Bode

Research Experience:

Lawrence Berkeley National Laboratory

Post-doctoral Associate

- Development of a novel method of reactive ligand stripping of nanocrystal surfaces using Meerwein's Salt, which enabled improved electronic properties as well as control of nanocrystal surface chemistry and solubility. *Patent application in progress.* This work was featured in a Lawrence Berkeley National Laboratory news highlight (<http://newscenter.lbl.gov/feature-stories/2011/12/08/nanocrystals-go-bare/>).

- Design and study of heterometallic probe ligands for nanocrystal surface passivation. These probe ligands were used to characterize nanocrystal-ligand bonding interactions using X-ray spectroscopic techniques. Field effect transistors were fabricated and tested to relate surface properties to device performance.
- Synthesis of lead selenide nanocrystals and detailed characterization of their optoelectronic properties.

University of Texas at Austin

Graduate Research Assistant

- Synthesis and study of both the first *N*-aryl acyclic diaminocarbene, and also the first examples of ruthenium metathesis catalysts incorporating this class of ligands, with detailed characterization both in solution and in the solid state. *PCT Application No. PCT/US2010/054661*.
- Development of a unique class of redox-active ligands based on ferrocene-fused diaminocarbenes which were studied using a variety of techniques (cyclic voltammetry, FT-IR-spectroelectrochemistry), and their incorporation into ruthenium complexes to give redox-active metathesis catalysts.
- Fundamental investigation of a series of redox-active ligands to determine if the position of a redox-active group incorporated into a carbene-based scaffold influences the extent of electronic communication with a coordinated transition metal, as determined by electrochemical and FT-IR-spectroelectrochemical analyses.
- Detailed investigation of metal-metal and metal-ligand electronic communication in phosphorescent bimetallic complexes using photophysical and electrochemical analyses.
- Study of electronically tuned *N*-heterocyclic carbene (NHC) ligands. Effect of electronic tuning on catalytic hydroborations and Suzuki-Miyaura reactions was determined and found to influence reaction yield and kinetics.
- Experience with RAFT and ROMP polymerization reactions and characterization of resulting polymers.

University of California Santa Barbara

Undergraduate Researcher

- Optimization of a new catalytic lactone forming reaction catalyzed by *N*-heterocyclic carbenes. This work was featured in an Angewandte highlight (*Angew. Chem. Int. Ed.* **2005**, *44*, 7506).
- Participated in pilot class of the university's first research-based undergraduate organic laboratory course.
- Total 3+ years of undergraduate research experience.

Selected Synthetic Techniques:

Materials Science

- Colloidal synthesis of quantum-dots (lead selenide)
- Device fabrication employing layer-by-layer methods (LbL)

Organic

- Synthesis of air- and moisture-sensitive compounds including carbenes, phosphines, and amines
- Expert in isolation and purification procedures including column chromatography, recrystallization, and distillation

Inorganic/Organometallic

- Experience with inert-atmosphere techniques (Schlenk, drybox)
- Handling of toxic gases (CO) and hazardous gases (HCl)
- Synthesis of highly pyrophoric organometallic materials (dilithioferrocene) and explosive compounds (azides)

Selected Analytical Techniques:

- Electrochemistry (CV, DPV, chronoamperometry)
- Electron microscopy (SEM, TEM, STEM) and energy-dispersive X-ray spectroscopy (EDS)
- Experience with synchrotron radiation experiments: X-ray photoelectron spectroscopy (XPS), X-ray absorption spectroscopy (XAS), and X-ray emission spectroscopy (XES) at the Advanced Light Source (ALS), Lawrence Berkeley National Laboratory and Stanford Synchrotron Radiation Lightsource (SSRL)
- NMR spectroscopy (^1H , ^{13}C , ^{19}F , ^{31}P , NOE-difference, var-T)
- IR (solution, film, mull, spectroelectrochemical)

- UV/vis/NIR spectroscopy (solution, spectroelectrochemical) and fluorimetry
- Powder X-ray Diffraction (XRD) and Single crystal X-ray diffraction (selecting, mounting, collecting)
- Inductively-coupled plasma atomic emission spectroscopy (ICP-AES)
- Thermogravimetric analysis (TGA)
- Separation techniques (GC, LC, GC-MS, LC-MS, GPC)

Teaching experience:

The Molecular Foundry

Undergraduate student mentor

Summer 2011

- Mentor of Summer Undergraduate Leadership Intern (SULI) student at Lawrence Berkeley National Laboratory. This role involved training the undergraduate student in inert-atmosphere techniques, synthesis of organometallic complexes, and working together to develop methods to characterize nanocrystal surface composition.

University of Texas at Austin

Teaching Assistant

Organic chemistry lecture

2009

- An introductory organic chemistry undergraduate course. Responsibilities included holding weekly review sessions and office hours, in addition to grading homework and exams. This position provided an opportunity to advance communication skills in front of a large audience.

Advanced organic chemistry lab

2008

- Organic chemistry lab for upper-division undergraduate students. Obligations included supervising students in lab, training students on a NMR spectrometer and teaching students how interpret the spectra obtained. Purification techniques including column chromatography were also introduced.

Organic chemistry lab

2007

- Organic chemistry lab for undergraduate students. Office hours were used to review key topics covered and work example problems.

General chemistry lab

2006

- An introductory lab for undergraduate students. Teaching responsibilities involved supervising lab sections, grading lab reports, and holding office hours.

Undergraduate student mentor

2008-2010

- Mentor of undergraduate students in a research laboratory setting for 2+ years. This role involved training undergraduate students in numerous synthetic and analytical techniques, with focus on inert-atmosphere and handling of air- and moisture-sensitive compounds. *Research conducted by these students has lead to undergraduate publications.*

Other professional experience:

Software Proficiency

Microsoft Office (Word, Excel, Powerpoint)

Kaleida Graph and Origin (kinetic analysis, spectroelectrochemical plots)

Chem Office (publication-quality schemes and figures)

Ortep (X-ray crystal graphics)

Adobe Photoshop (image editing)

Peer-Reviewed Publications:

Lawrence Berkeley National Laboratory

10. Duong, J. T.; Bailey, M. J.; Pick, T. E.; McBride, P. M.; Rosen, E. L.; Buonsanti, R.; Milliron, D. J.; Helms, B. A. "Efficient polymer passivation of ligand-stripped nanocrystal surfaces," *J. Polym. Sci. A. Polym. Chem.* **2012**, *50*, 3719.
9. Rosen, E. L.; Buonsanti, R.; Llordes, A.; Sawvel, A. M.; Milliron, D. J.; Helms, B. A.; "Exceptionally Mild Reactive Stripping of Native Ligands from Nanocrystal Surfaces Using Meerwein's Salt" *Angew. Chemie, Int. Ed.* **2012**, *51*, 684.

University of Texas at Austin

8. Collins, M. S.; Rosen, E. L.; Lynch, V. M.; Bielawski, C. W.; "Differentially Substituted Acyclic Diaminocarbene Ligands Display Conformation-Dependent Donicities" *Organometallics* **2010**, *29*, 3047.
7. Rosen, E. L.; Sung, D. H.; Chen, Z.; Lynch, V. M.; Bielawski, C. W.; "Olefin Metathesis Catalysts Containing Acyclic Diaminocarbenes." *Organometallics* **2010**, *29*, 250.
6. Rosen, E. L.; Varnado Jr., C. D.; Tennyson, A. G.; Khramov, D. M.; Kamplain, J. W.; Creswell, P. T.; Sung, D. H.; Lynch, V. M.; Bielawski, C. W.; "Redox Active N-Heterocyclic Carbenes: Design, Synthesis, and Evaluation of Their Electronic Properties." *Organometallics*, **2009**, *28*, 6695.
5. Tennyson, A. G.; Rosen, E. L.; Collins, M. S.; Lynch, V. M.; Bielawski, C. W.; "Bimetallic N-Heterocyclic Carbene-Iridium Complexes: Investigating Metal-Metal and Metal-Ligand Communication via Electrochemistry and Phosphorescence Spectroscopy." *Inorganic Chemistry*, **2009**, *48*, 6924.
4. Khramov, D. M.; Rosen, E. L.; Er, J. A. V.; Vu, P. D.; Lynch, V. M.; Bielawski, C. W.; "N-Heterocyclic Carbenes: Deducing σ - and π -Contributions in Rh-Mediated Hydroboration and Pd-Mediated Coupling Reactions" *Tetrahedron*, **2008**, *64*, 6853.
3. Khramov, D. M.; Rosen, E. L.; Lynch, V. M.; Bielawski, C. W.; "Diaminocarbene[3]ferrocenophanes and Their Transition-Metal Complexes" *Angew. Chem. Int. Ed.* **2008**, *47*, 2267.
2. Rosen, E. L.; Sanderson, M. D.; Saravanakumar, S.; Bielawski, C. W.; "Synthesis and Study of the First N-Aryl Acyclic Diaminocarbene and Its Transition-Metal Complexes" *Organometallics* **2007**, *26*, 5774.

University of California Santa Barbara

1. Sohn, S. S.; Rosen, E. L.; Bode, J. W. "N-Heterocyclic Carbene-Catalyzed Generation of Homoenoates: gamma-Butyrolactones by Direct Annulations of Enals and Aldehydes", *J. Am. Chem. Soc.* **2004**, *126*, 14370.

Personal Interests:

- Cultural dance
- Motorcycle riding
- Knitting and crocheting
- Cooking
- Art and music
- Computer gaming